

# Food Supplementation for Beef Cattle Raised on Pasture in the North of Minas Gerais

Gilmar Antunes Saude Neto, Iara Alves de Sousa, Jackeline Freitas da Silva, Letícia Campos Santos, Daniel Rodrigues Silva, Maria Eduarda Lima da Silva, Tauan Bremer Ramalho, Vania Graça Santos, Vinícius Nascimento Santos, Wagner Mendes Rodrigues

Received: 12 Sep 2023,

Receive in revised form: 25 Oct 2023,

Accepted: 05 Nov 2023,

Available online: 11 Nov 2023

©2023 The Author(s). Published by AI  
Publication. This is an open access article  
under the CC BY license

(<https://creativecommons.org/licenses/by/4.0/>).

**Keywords—** Bovine. Food Supplementation.  
Pasture System.

**Abstract—** Brazil stands out for having the second largest cattle herd in the world, close to 208 million heads. Supplementation of pastured animals is an area of great interest in veterinary training. This is because food is one of the main factors that influence the productivity and health of animals, and nutritional supplementation is an important strategy to ensure the supply of adequate and sufficient nutrients to meet the animals' needs. If supplementation is not carried out properly, there may be an imbalance in the animals' diet, leading to health problems and reduced performance. Therefore, this work presents the problem question: What is the best food supplement for beef cattle? This work aims to describe the effects of supplementation on beef cattle in the pasture system. Analyze what the national beef cattle industry is like. Address the effect of supplementation on the performance of beef cattle in a pasture system. Identify supplementation during the rainy season, as well as its causes and effects. Explain pasture supplementation strategies for beef cattle. This is a methodology carried out through a bibliographic review of qualitative literature research. With a questionnaire applied to producers who visit the 26th Expoagro de Nanuque in September 2023.

## I. INTRODUCTION

Brazil stands out for having the second largest cattle herd in the world, close to 208 million heads, occupying a pasture area of 169 million hectares with a stocking rate of 1.23 heads and an annual slaughter of 43.3 million. of heads, of which 90.7% are on pasture and 9.3% in confinement, obtaining an annual production of 10.2 million tons of meat equivalent to the carcass, with 80.9% of production destined for the domestic market and 19.6% to exports (ABIEC, 2013).

This work is justified in showing that the supplementation of animals on pasture is an area of great interest in the training of veterinarians. This is because food is one of the main factors that influence the productivity and health of animals, and nutritional supplementation is an

important strategy to ensure the supply of adequate and sufficient nutrients to meet the animals' needs.

Supplementation of pasture animals aims to correct pasture nutritional deficiencies, increase pasture support capacity, increase body weight, reduce slaughter age, assist in pasture management and provide additives or growth promoters (REIS; MELO; BERTIPAGLIA, 2005).

If supplementation is not carried out properly, there may be an imbalance in the animals' diet, leading to health problems and reduced performance. The production of concentrated foods for food supplementation can generate environmental impacts, such as deforestation, intensive use of natural resources and gases. Therefore, it is essential to carry out a careful analysis of the benefits and risks before deciding on dietary supplementation for grass-

fed beef cattle, and seek guidance from a professional specialized in the area. Therefore, this work presents the problem question: What is the best food supplement for beef cattle?

Therefore, the main function of the digestive system is to digest and absorb food and excrete products that are not used by the body. The gastrointestinal tract consists of the mouth, pharynx, esophagus, stomach, small intestine (duodenum, jejunum and ileum), large intestine (cecum, colon and rectum) and anus, as well as accessory glands (saliva, pancreas and liver) (SILVA; LEÃO, 1979).

The digestive tract of ruminants has undergone some changes due to evolution, and this change is mainly due to the type of diet these animals eat, which is based on foods with a high fiber content. Changes in the gastrointestinal tract of ruminants begin in the mouth, as these animals do not have upper incisors, and the cow's tongue acts as a plunger, grabbing the food and transporting it into the mouth (KÖNIG; LIEBICH, 2016).

The motor function of the gastrointestinal tract is an important process related to digestion and absorption of nutrients. The walls at all levels of the gastrointestinal tract are muscular and capable of movement. The movement is called agency. The time it takes for a substance to pass from one part of the gastrointestinal tract to another is called transit time. These movements have multiple functions: moving food from one portion to the next; retain ingested matter in certain segments for digestion and absorption; physically breaking down food raw materials; mix the material with digestive secretions and facilitate the circulation of the substance ingestion so that all parts are in contact with the absorbent surface (CUNNINGHAM; KLEIN, 2008). Because this must promote continuous growth of grazing animals, there is a need for strategic supplements during the different seasons of the year, which provide limiting nutrients and increase the efficiency of pasture use (VALENTE, 2012).

Pasture supplementation strategies for beef cattle may vary according to local conditions, time of year and the stage of development of the animals. It is essential that supplementation is carried out appropriately, taking into account the quality of the supplements used and the way they are provided to the animals.

This work aims to describe the effects of supplementation on beef cattle in the pasture system. Analyze what the national beef cattle industry is like. Address the effect of supplementation on the performance of beef cattle in a pasture system. Identify supplementation during the rainy season, as well as its causes and effects. Explain pasture supplementation strategies for beef cattle.

This is a methodology carried out through a

bibliographical review of qualitative literature research that allows the synthesis of various available research on dietary supplementation and directs practice based on scientific recognition. With the application of a questionnaire (Annex 1) to producers who visit the 26th Expoagro de Nanuque in September 2023.

## II. BEEF LIVESTOCK

Beef livestock farming is a very important economic activity in Brazil, as it is one of the main sectors of the Brazilian agroindustry. Beef is one of the most consumed foods in the country and also an export product.

Brazil is one of the largest producers and exporters of beef in the world with an estimated herd of more than 220 million cattle. Beef production in Brazil is mainly based on pastures, which reduces animal profits due to livestock limitations. Therefore, the use of supplements is an alternative that allows zootechnical gains, generating greater profitability for the system (SENAR, 2018).

The Brazilian beef cattle production system consists of the breeding, reproduction and finishing phases. Mating can be defined as the final phase of weaning until the moment when, normally, females are used for reproduction (breeders) and males for production (fattening). One of the important characteristics of this phase is the animal's ability to gain efficiently, as it has a smaller allocation of energy consumed for maintenance, thus being able to allocate a greater amount to muscle and bone growth (MEDEIROS; ALMEIDA; LANNA, 2010).

More than 80% of the 220 million head of cattle are grazed. This increases the demand for more productive and resistant plants in the system, especially if more sustainable production is needed. Around 70% of Brazil's pastures are currently in decline, leading many to believe that the majority are not reaching their current production potential (MORCELLI, 2020).

## III. PHYSIOLOGY

The movements of the digestive tract act on ingested food to perform the following functions: propel food along the digestive tract, hold food in place for digestion, absorption, or storage, facilitate the physical breakdown of food, and mix food with secretions digestive (OLIVEIRA, 2016).

Peristalsis of the gastrointestinal tract consists of the relaxation and contraction of the sphincter wall corresponding to the motility of the gastrointestinal tract, and the function of peristalsis is to crush, mix and break

down ingested food. The activity of smooth muscles in the digestive tract is initiated by intrinsic mechanisms located there. This mechanism determines the rhythm of contractions, with the exception of the anterior chamber of the stomach in ruminants, which is stimulated by nerves (RODRIGUES, 2018).

The digestive tract also has an endocrine regulatory system, and the gastrointestinal tract is the largest endocrine organ in the body. Endocrine cells are found in all tissues of the stomach, intestine and pancreas, and these cells synthesize and secrete hormones in response to stimuli (RODRIGUES; FONSECA; DAS NEVES, 2008).

#### IV. FOOD

Ruminants can use many types of foods in their diet. The fibrous carbohydrates stand out, making the animal easily identifiable. Microbes in the rumen are used to break down fiber. These fibers are important. The importance of maintaining and continuing to maintain the health conditions of ruminants.

However, most go through a stage of low nutritional quality that does not meet the minimum requirements for animal production. Animals in the rearing phase are generally exposed to poorer quality pastures, especially during the dry season of the year, resulting in productivity below the national average per hectare per year. Supplementation should be considered as an alternative to supplementation to increase yield in farmed animals. on pasture (ABIEC, 2016).

##### 4.1 PASTURE

Thus, seasonal changes in pasture characteristics strongly affect Brazilian beef cattle farming, especially pasture animals. During the dry season, forage production is significantly reduced, the aging of leaves and tillers is accelerated and tropical pastures, especially those kept under grazing, generally introduce low availability of good quality forage (EUCLIDES, 2000).

Around 80% of our fields today are made up of brachiaria, the majority being *Brachiaria brizantha*, cultivar (cv.) Marandu (Braquiara). *Brachiaria decumbens* cv. Basilisks were introduced to Brazil in the early 1960s.

It is a good option for sandy soils with low fertility, and can tolerate moderate acidity but is not particularly resistant to leaf attack. We have the genus *Brachiaria humidicola* cv. BRS Tupi is an alternative for humid areas with low to medium

fertility. It is a high yield and fertility forage, has early flowering, dense clusters, long and narrow leaves and is well distributed throughout the year, guaranteeing an average performance superior to the regular variety (Quicuio) (MORCELLI, 2020, p.2).

The genus *Panicum* is increasingly used in this country. In general, productivity is high in DM/ha/year and the nutritional value is higher than that of *Brachiaria*. However, this makes soil fertility more demanding and makes it more difficult for farms to accommodate fluctuations in animal stock throughout the year, making the difference in productivity between the rainy and dry seasons even greater. The wing growth form (vertical septosis) promotes less soil coverage than other growth forms, such as brachial (squatting) and is not recommended for very steep areas (MORCELLI, 2020).

Colonião grass is the most famous variety of the *Panicum* genus, and one of the oldest, but still dominant in some areas. In the mid-1990s, Embrapa launched the Mombaça variety, which became very popular among breeders due to its higher leaf/stem ratio, high yield (up to 33 tons/ha) and low aging in the dry season (MORCELLI, 2020 ).

The use of forages under grazing is a very common alternative in the meat production scenario in Brazil, with grazing being the main source of raw material for the production of ruminants in tropical conditions (RESENDE; SIQUEIRA; OLIVEIRA, 2018).

In situations where grazing is ineffective in providing a certain level of production, complementary feeding is an opportunity for the producer to improve animal nutrition. Additives are used to promote lactation in young animals, improve reproduction and growth rate.

Supplementing pastures with easily digestible forage can improve cattle performance by improving nitrogen absorption from forage in the rumen, increasing microbial protein production, increasing the production of digestible non-food protein in the rumen, and increasing propionate and propionate production. total. volatile fatty acids (HOOVER, 1986, p.2749).

The digestive system is the site of many problems in ruminants, especially those related to pre-gastric diseases and nausea. However, small intestinal obstructive disease occurs frequently and care must be taken to include it in the differential diagnosis of gastrointestinal

disorders that cause abdominal distension in cattle (REBHUN, 2000).

## 4.2 SUPPLEMENTATION

According to Pigurina (1993), there are specific benefits associated with dietary supplements: the ability to quickly take advantage of price conjunctions; short-term return on investment; almost immediate implementation; low relative costs; successful security.

The basic objective of concentrated feed supplements for grazing animals is to replenish the nutritional value of the pasture, thus increasing the efficiency of pasture use. Therefore, using dietary supplements, such as concentrates, during two seasons can correct specific nutritional deficiencies.

Supplementation is generally given at low levels to increase the availability of nutrients for ruminant microorganisms, improving the use of structural carbohydrates obtained from pasture resulting in better animal performance (CARDOSO; MACHADO; SCHUMACHER; FERNANDES; ANTUNES; SCHENKEL; RODRIGUES; BRONDANI, 2020). The use of supplements is a tool that improves the productive performance of cattle on pasture by providing nutrients not provided by pasture and is fundamental for the efficient conversion of forage into meat, being one of the main strategies to meet the demands of the animal protein market for ensure food security for the population.

Dietary supplementation in beef cattle in cattle feeding systems Pasture can be an important strategy to improve animal performance and increase meat production. Supplementation aims to provide additional nutrients that may be lacking in pasture, especially during periods of forage scarcity.

For Euclides (2005), in the case of pasture supplementation, it is important to meet the needs of the animals and complement the nutrients available in the pasture. Therefore, the nutritional value of the available forage must be supplemented to achieve the desired performance. However, for this to be adequate and effective, a good estimate of forage consumption and quality is necessary.

In terms of food management, the pasture must have flat land, good water distribution, avoid an increase in maintenance energy and facilitate the acquisition and distribution of feed. To avoid competition between animals for supplements, provide troughs that allow simultaneous use, 40 to 50 cm/animal is recommended when concentrated feed is

provided and 20 to 25 cm/animal is recommended for multiminerall mixtures (EUCLIDES, 2005, p. 42).

Supplementing pastures with specific nutrients has been used as a way to improve animal performance, however, depending on the level of concentrate supply used, changes in consumption, nutrient digestibility and performance parameters (MATEUS; DA SILVA; ÍTAVO; PIRES ; SIVAR; SCHIO, 2011). Food supplementation for beef cattle during the dry season is an important strategy to maintain animal performance and avoid weight and productivity losses. During a dry season, forage availability can be reduced due to lack of rain and the resulting water stress on plants. Furthermore, the nutritional quality of the forage may be impaired, with low protein and energy levels.

### 4.2.1 PROTEINATE

A lack of adequate nutrients in the diet can lead to a series of health problems in animals, such as low immunity, reproductive problems and less weight gain. Food supplementation during the dry season aims to provide additional nutrients that may be lacking in the animals' diet, helping to maintain the animals' performance and productivity (MALAFAIA; PEIXOTO; GONÇALVES; MOREIRA; COSTA; CORREA, 2004).

According to Malafaia et al. (2004), there are three main types of supplements:

1. Protein Supplement: A mixture of urea and/or dietary protein plus sodium chloride (NaCl) and mineral salts.
2. Energy supplement: refers to the mixture of NaCl plus mineral salt and energy food.
3. Mixed or Multiple Multiple Supplement: Refers to the mixture of urea plus NaCl, mineral salts, energy food and protein food. In other words, 5 protein supplements + energy supplement. It is also a concentrated food with voluntary consumption regulators (MALAFAIA; PEIXOTO; GONÇALVES; MOREIRA; COSTA; CORREIA, 2004, p.160).

Providing protein supplements as a source of nitrogen during the dry water period leads to the proliferation of fiber-decomposing bacteria that use fibrous carbohydrates as substrates and ensures improved digestibility, voluntary consumption rate, rate of microbial protein synthesis and improved rate of microbial protein synthesis, thus improving the energy use of fibrous carbohydrates in feed (COSTA; MONTEIRO; SILVA, 2015).



For Quadros et al., (2016) protein supplementation alone is not enough to improve the animal's weight gain in this critical period of the year, as it only meets the animal's needs. Maintenance or at most small gains of less than 50 g/animal/day of daily gain when evaluating Nelore steers supplemented with protein salts in the dry period.

Therefore, it is interesting to use different mixtures as supplements during droughts, as such supplements can increase the consumption and digestibility of low-quality forage and the average daily gain exceeds 0.73 kg/animal/day. According to García et al. (2014) observed an increase in body weight of more than 0.700 kg when they provided protein-energy supplementation (0.8% of body weight) to crossbred bulls in a grazing system.

#### 4.2.2 MINERAL

Mineral supplementation can represent 20% to 30% of the total production costs of grazing cattle. This highlights the economic importance of mineral supplementation and the adequate assessment of the herd's needs and requirements can help reduce feed costs (PEIXOTO; MALAFAIA; BARBOSA; TOKARNIA, 2005).

According to Teixeira et al., (2011) in cattle nutrition, minerals play an important role in the good development of the animal. These functions are essential for the perfect functioning of the body. Phosphorus performs many functions in the body. As Brazilian pastures, especially those in Central Brazil, are known to be deficient in this mineral, phosphate supplementation of pasture-raised cattle is essential for good agricultural performance.

Another important factor when talking about mineral supplementation is the antagonism between certain minerals. Depending on the amount and type of minerals contained in the mixture, it may inhibit the effects of another element or elements. An example of this antagonism is the use of iron sulfate in mineral mixtures. Iron sulfate reduces the absorption of phosphorus and copper in animals (PEIXOTO; MALAFAIA; BARBOSA; TOKARNIA, 2005).

Some minerals have shown surprising performance in supplementation, such as chromium chelate added to mineral supplements for Nelore cattle, resulting in greater weight gain and increased hot carcass yield (MOREIRA; LOURENÇO; POLIZEL NETO; HEINRICH; BERBER, 2012).

#### 4.2.3 RATION

Feed balancing consists of providing sufficiently nutritious food that meets the animal's protein, energy, vitamin and mineral needs. Therefore, we face a number

of challenges, including the importance of balance. If your diet is unbalanced, you have an excess and/or deficiency of certain nutrients.

Some imbalances have serious consequences and, if left untreated, can even lead to the death of the animal (for example, a calcium imbalance at birth can cause milk fever and death of the animal if not treated immediately). Various Symptoms Are Observed In animals, it can help identify symptoms related to imbalances, especially vitamin and mineral deficiencies. However, other imbalances are difficult to identify as they result from some degree of performance loss. Cattle do not perform as well as their genetic potential would allow when there is an imbalance in the ration (SILVA, 2021, p. 7).

A balanced ration is the amount of food that provides the animal with a variety of nutrients in proportions corresponding to a specific daily production. Feed formulation therefore involves the integration of knowledge related to the animal's needs (for a specific production level), the nutritional properties of the feed and the expected costs/benefits (EMBRAPA, 1979).

Before proceeding with ration balancing, you need to have a clear idea of the type of animal you are feeding and the desired production level. Within the limits of this publication, abstinent beef cattle have only two functions in terms of nutritional requirements: maintenance of live weight and weight gain (EMBRAPA, 1979).

## V. RESULTS AND DISCUSSIONS

The results obtained with the application of the online questionnaire my.survio.com, through a direct link, QR code or even WhatsApp, are sent to producers who visited the 26th Expoagro de Nanuque in September 2023. From producers who visited the expoagro and 55 people entered the online questionnaire, but in fact, 27 producers completed it and completed it until the end, with an average of 49.1% and the counterpart to 28 producers who did not complete the questionnaire.

Planning and controlling feeding in grazing systems is an important issue to achieve efficiency, increase performance and reduce risks. To this end, pasture management practices and additives for livestock feed are sources that can be used as tools for such planning (PEREIRA; REIS; BERCHIELLI; BERTIPAGLIAS; MELO, 2008).

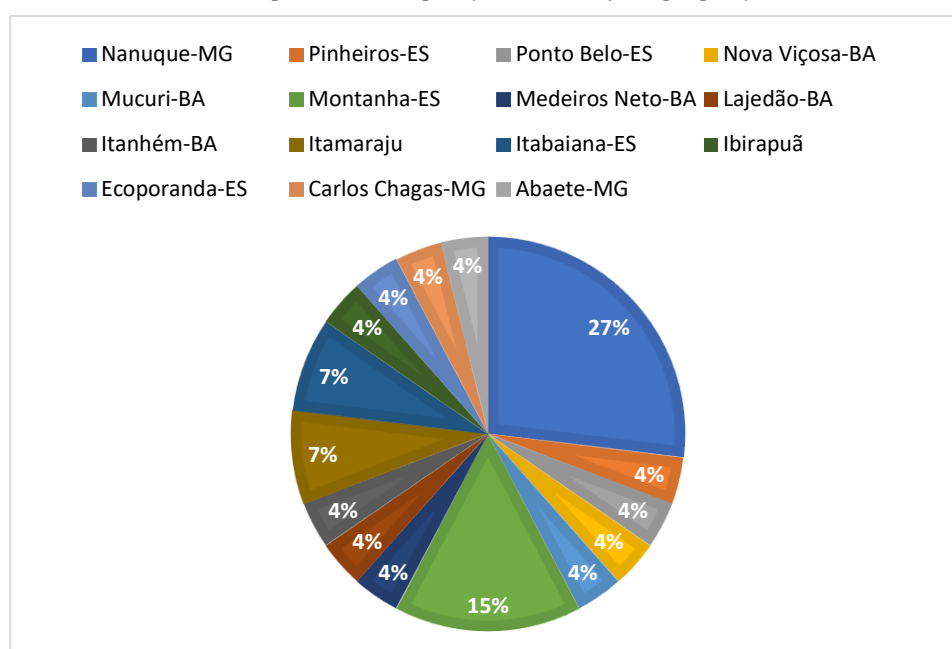
Food supplements have an impact on the sustainability of beef cattle production systems, especially in central Brazil. This is due to the strong seasonality of livestock farming in the region, with plant growth greatly reduced during the dry season. Water is obviously the most limiting growth factor, but shorter photoperiods and cooler temperatures also limit forage availability (GOMES; NUÑEZ; MARINO; MEDEIROS, 2015).

Adding drive wheels during the rainy season can help with pasture management, resulting in better nutrient utilization, more efficient use of feed and improved animal performance. Concentrated supplements generally reduce feed intake, especially if they have similar nutritional properties to pastures. Under conditions of high substitution effect, overcrowding occurs, therefore the number of animals needs to be adjusted according to the available

stock, which can be done using management criteria based on height (REIS; BARBERO; KOSCHECK, 2014).

Several producers visited the 26th Expoagro de Nanuque in September 2023, which is an agricultural exhibition, bringing together producers, exhibitors and the entire region. the objective of promoting agriculture, livestock, agroindustry and rural development. This event includes animal exhibitions, competitions, auctions, agricultural company stands, shows, lectures and other activities related to the agricultural sector. Many producers participated, where 27% of participants are from the municipality of Nanuque-MG, 15% are from the municipality of Montanha-ES, Itamaraju-BA and Medeiros Neto-BA with the participation of 14% of producers, other municipalities that participated in expoagro boa part came from Bahia and Espírito Santo as we will see in graph 1.

Graphic 1-Municipality and State of the property.



Source: Prepared by the author.

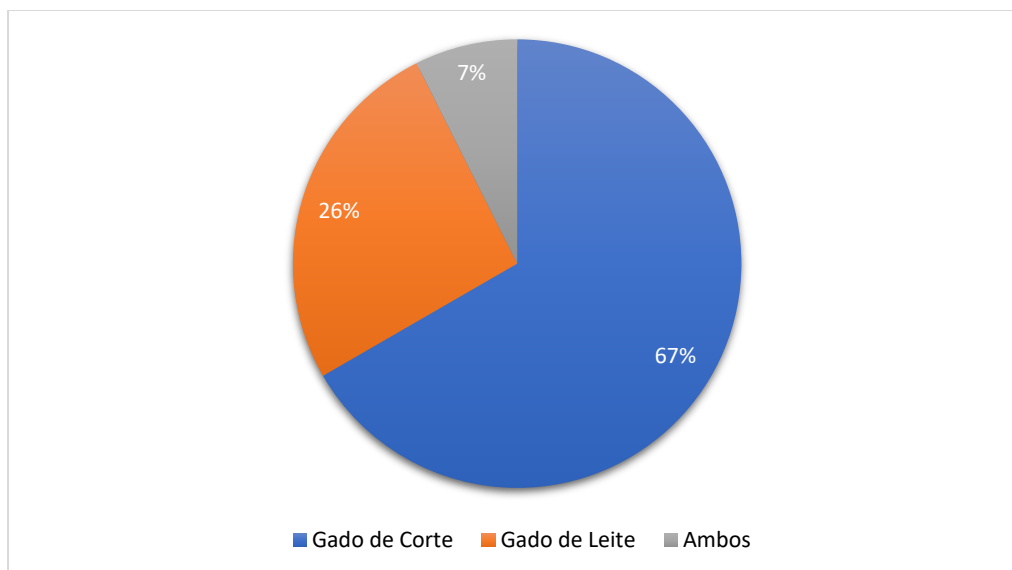
According to Marion (2007), livestock farming consists of the “art of raising and caring for livestock”, and among some agricultural activities, livestock farming or livestock farming is one of the main aspects of Brazilian agricultural businesses and is commonly practiced. It is used for milk (dairy) or meat (livestock) purposes.

There are two main categories of livestock production: beef cattle and dairy cattle. Each of these categories involves different breeding systems and

production objectives.

Beef cattle production is vital for Brazil, which has the largest commercial cattle herd in the world. According to the Brazilian Institute of Geography and Statistics (IBGE), there are approximately 209 million cattle, a result of poor nutrition, sanitation problems, inefficient management and low genetic potential of the animals (PORTAL BRASIL, 2015).

Graph 2- What type of production?



Source: Prepared by the author.

The expoagro producers, when asked about the production of their farms, are 67% have beef cattle, 28% of the producers have dairy cattle and 7% of them have beef and milk as we saw in graph 2. According to Lazzarini Neto (2000), “There is no other activity in this area, which has potential for growth, income generation and foreign

exchange, like beef production”. For Euclides Filho (2008), beef cattle production encompasses a set of technical and management practices, types of animals, breeding purpose, race or ethnicity and ecological region in which the activity takes place.

Table 1-Use of mineral salt.

Mineral Salt	Whole year	Dry	Water	Do not use
Whole herd	22	two	1	1
Matrices	11	3	0	1
Rebreeding of Males	14	0	1	1
Rearing of Females	13	two	0	1
Male termination	12	0	0	3
Termination of females	8	two	0	4

Source: Prepared by the author.

In table 1 we see that 22 producers add mineral salt supplements to their herd throughout the year. Because complementation is a practice that can be integrated systematically or structurally into the management of a business, or can be seen as a situational solution for certain situations. From a safety perspective, replenishment can continue production in the case of “abnormal” deficits, the frequency of which is unpredictable. In emergencies, replenish preservation or maintenance. To increase yields, supplements are used during “normal” times when forage is scarce, which is repeated seasonally every year. In production systems that operate at very high capacities,

shortages are exacerbated during normal and abnormal periods (ROCHA, 2020).

Supplementation has indirect side effects: better management of pastures grazed by supplementary animals; possibility of using more appropriate capacity for other categories; maximum relative load that the pot can support and replenishment, possibility of timely purchase and appreciation of acquired kilograms (LANGE, 1980).

Therefore, mineral salt containing urea is an additional and low-investment alternative in dry conditions. The objective is to maintain the animal's body weight during this period. Food availability must be good, even if

it is of poor quality. The recommended application rate is approximately 100 g/PV, with approximately 30% of this amount being urea. A linear trough of at least 6 cm per

animal is recommended (GOMES; NUÑEZ; MARINO; MEDEIROS, 2015).

*Table 2-Use of white salt.*

White Salt	Whole year	Dry	Water	Do not use
Whole herd	12	1	0	11
Matrices	6	two	0	5
Rebreeding of Males	8	1	0	5
Rearing of Females	6	two	0	5
Male termination	6	1	1	5
Termination of females	3	two	0	7

Source: Prepared by the author.

According to table 2, many producers use white salt throughout the year in their herd. In this scenario, the use of supplements concentrated in both drought and water can correct specific nutritional deficiencies in the feed to

maximize utilization by rumen microorganisms and increase weight gain (REIS; RUGGIERI; OLIVEIRA; AZENHA; CASAGRANDE, 2012).

*Table 3-Use of protein.*

Protein	Whole year	Dry	Water	Do not use
Whole herd	8	12	0	5
Matrices	9	1	0	4
Rebreeding of Males	7	3	0	4
Rearing of Females	7	two	0	5
Male termination	11	two	0	1
Termination of females	7	two	0	4

Source: Prepared by the author.

Protein is more expensive than salt containing urea, but it is more economically practical because it is supplied in small quantities (1 to 2 g/kg) per animal. The recommended linear trough for protein delivery is 12 to 15 cm per animal. Filling the trough with proteins should be done as frequently as possible within the limits of each organ.

The ideal frequency will depend on local conditions, including labor costs, availability, distance from pastures, and animal utilization patterns. However, it

is not recommended to leave more than a week between filling the water tank. In fact, one of the biggest challenges when using protein products is keeping your intake restricted. flat. Sometimes identical protein products come from the same farm, the same pasture and the same batch, resulting in differences in consumption. Therefore, it is recommended to determine the frequency of filling the trough and monitor consumption to achieve the planned consumption and know exactly the financial cost of the additives (GOMES; NUÑEZ; MARINO; MEDEIROS, 2015, p.67).

*Table 4-Use of 18% CP feed.*

Protein	Whole year	Dry	Water	Do not use
Whole herd	11	1	0	10
Matrices	4	two	0	8
Rebreeding of Males	4	4	0	7



<b>Rearing of Females</b>	5	1	0	8
<b>Male termination</b>	7	1	0	4
<b>Termination of females</b>	6	1	0	6

Source: Prepared by the author.

The total amount of food an animal consumes in a 24-hour period. For the purpose of product registration under the terms of Normative Ordinance 13/2004 of the Ministry of Agriculture; Livestock and Feed – MAPA, Feed is a mixture of ingredients and additives intended for livestock feed and represents the final product. be available

and able to meet the nutritional needs of the target animal; It is a brittle and homogeneous food mixture with a moisture content of less than 13%. Its composition must include 18-20% crude protein (CP) and approximately 70% total digestible nutrients (TDN) (BRASIL, 2004).

Table 5-Use of 20% CP feed.

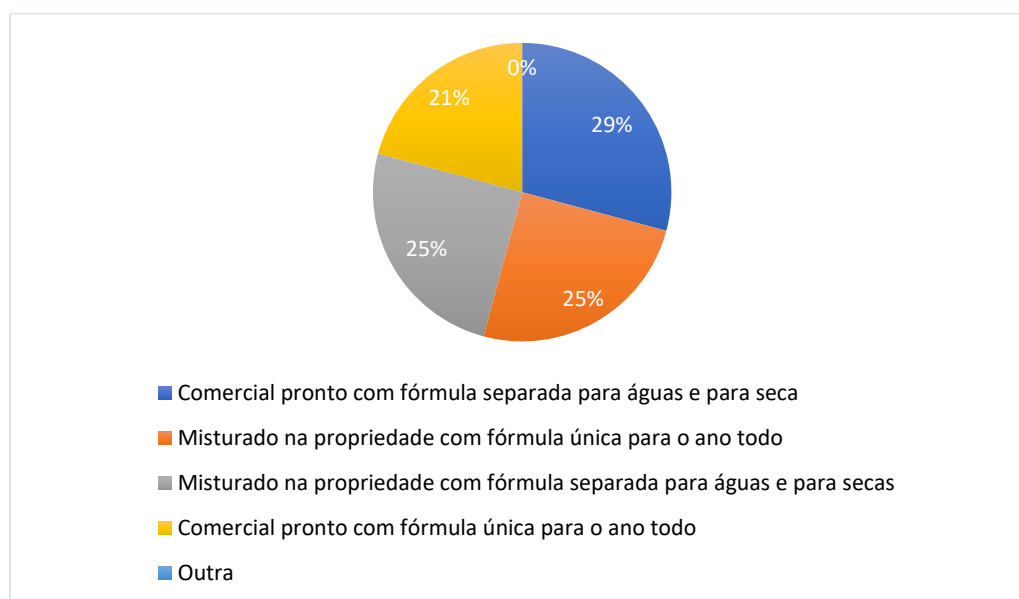
<b>Protein</b>	<b>Whole year</b>	<b>Dry</b>	<b>Water</b>	<b>Do not use</b>
<b>Whole herd</b>	6	3	0	14
<b>Matrices</b>	1	3	0	9
<b>Rebreeding of Males</b>	1	two	0	9
<b>Rearing of Females</b>	3	two	0	8
<b>Male termination</b>	4	3	0	7
<b>Termination of females</b>	3	4	0	6

Source: Prepared by the author.

The total amount of food that an animal must consume in a 24-hour period to cover its nutritional needs. In fact, it is the amount of feed calculated to cover the nutrients needed for maintenance and production. H. Depending on the category of animals, they are at different stages of life. A balanced diet contains all the nutrients an

animal needs to satisfy its specific physiological needs and must cover its nutritional needs from a quantitative and qualitative perspective. A balanced diet is usually prepared for a group of animals with similar needs (SALMAN, 2011).

Graph 3- Mineral salt. What is the source of the supplement?



Source: Prepared by the author.

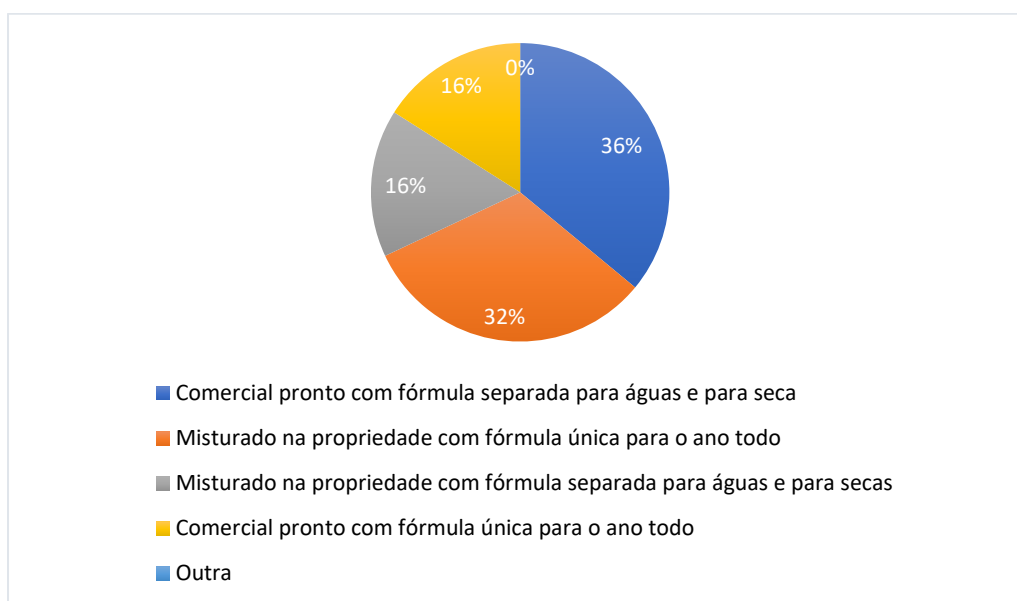
Mineral supplementation in cattle herds is known worldwide for its importance and is considered a fundamental aspect for the development of livestock farming, but it is also a necessary and viable practice from a productive and practical point of view.

Despite being recognized as such, it has almost always been left in the background. It looks economical too. Therefore, efficient pasture-based livestock production can only be achieved with the help of nutritional strategies and high-

quality products to reduce the negative effects of annual climate change (SEVERINO, 2018, p.12).

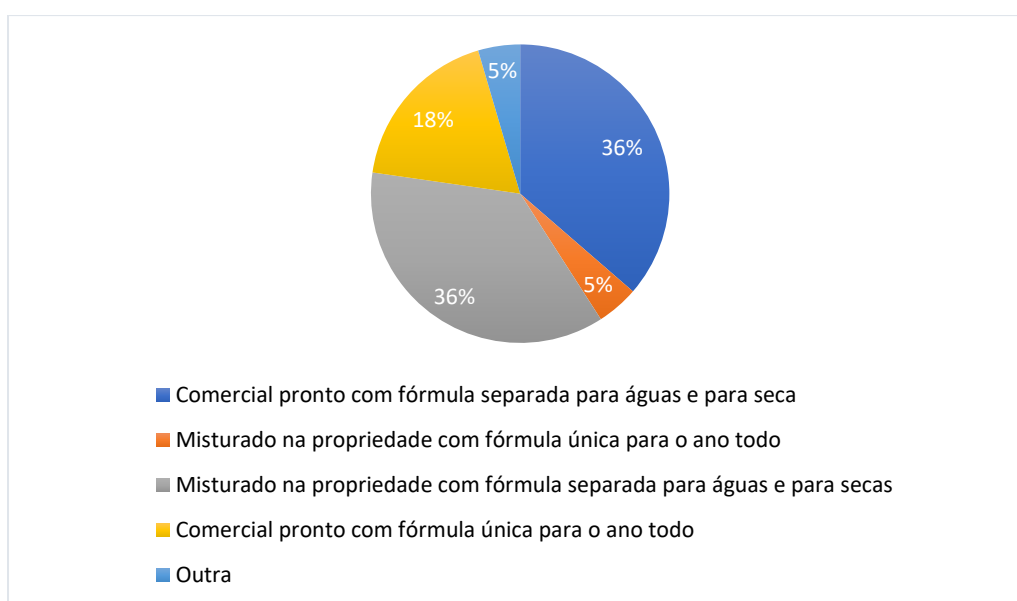
One of the most important points is the absorption of mineral salts by animals. This must be done in accordance with the manufacturer's recommendations. Recommendations vary depending on the type of food, soil fertility and fertilization, season, amount of salt in the water and reception conditions. Supplementary Content and Access/Location (AGROQUIMA, 2023).

*Graph 4-Protein. What is the source of the supplement?*



Source: Prepared by the author.

*Graph 5-Fed 18% CP. What is the source of the supplement?*

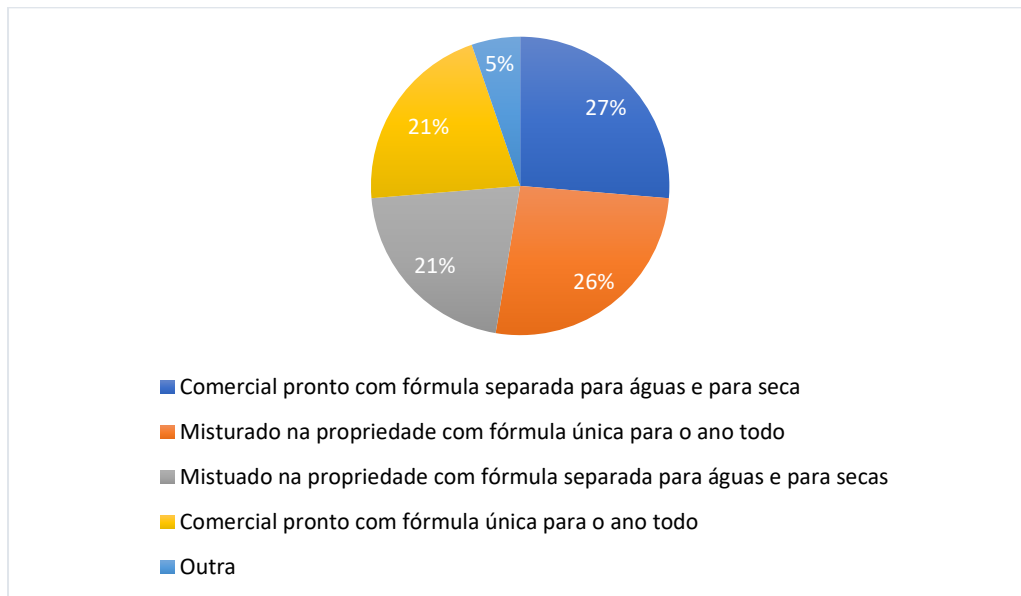


Source: Prepared by the author.

Feeds must be balanced using the cheapest ingredients possible to avoid a significant impact on the final cost. To compare available foods and use more, cheaper foods, it is necessary to know the relationship between the nutritional value or kg of nutrients and the price of the available foods. The food contained in the feed

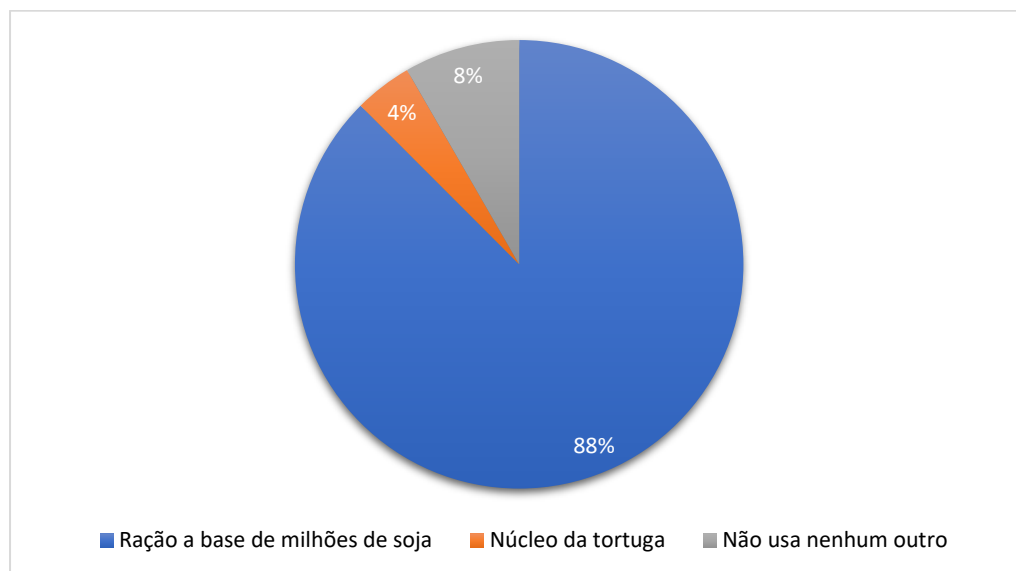
must be in good sanitary condition. It must not be subjected to undesirable fermentations or other changes that put the animal's health at risk. Furthermore, weevils, moths and other insects, not to mention rat urine, cannot attack stored grain. Contains leptospirosis, which transmits leptospirosis to animals and humans (SALMAN, 2011).

Graph 6-20% CP feed. What is the source of the supplement?



Source: Prepared by the author.

Graph 7- Another supplement?



Source: Prepared by the author.

According to graph 7, 88% of producers use the breed based on millions of soybeans, 8% use the tortuga nucleus, 4% do not use any other type of supplement.

Food should be as homogeneous as possible to

prevent animals from selecting and consuming the most tolerated components. The food must be prepared properly so that the animal can eat and enjoy it easily. To avoid fermentation and the associated gastrointestinal discomfort

in the animal, it is necessary to remove the waste left by the animal in the manger overnight (SALMAN, 2011).

## VI. CONCLUSIONS

The types of supplements used during the dry season may vary, depending on the nutritional needs of the animals and the forage characteristics available. Protein, energy and mineral supplements can be used, as well as concentrated foods such as corn, soy and cottonseed meal.

The effects of supplementation during the dry season include increasing weight gain, maintaining productivity and meat quality, and reducing costs with medicines and veterinary treatments. However, it is important to remember that supplementation must be carried out appropriately, taking into account the nutritional needs of the animals and the quality of the supplements used.

Furthermore, it is essential that supplementation is combined with other management practices, such as pasture rotation, pest and disease control and adequate herd management. Only in this way will it be possible to guarantee good animal performance and quality meat production during the dry season.

## REFERENCES

- [1] ABIEC. Brazilian Association of Meat Exporting Industries. 2013. Available at: <http://www.abiec.com.br/texto.asp?id=8>. Accessed on: April 6, 2023.
- [2] ABIEC. Brazilian Association of Meat Exporting Industries. Livestock Profile in Brazil – Annual Report 2016. Available at: <http://abiec.siteoficial.ws/images/upload/sumario-pt-010217.pdf>. Accessed on: 04/06/2023.
- [3] Agroquima Produtos Agropecuários LTDA. <<http://www.agroquima.com.br/agroquima>>. Accessed on: 04. Oct. 2023.
- [4] BRAZIL. Ministry of Agriculture, Livestock and Supply. Normative Instruction no. 13/04. **Technical regulation on additives for products intended for animal feed**. Official Gazette of the Union, Brasília-DF, 01 Dec. 2004, Section 1, p. 63.
- [5] CARDOSO, G. dos S., MACHADO, DS, SCHUMACHER, LL, FERNANDES, C. de A., ANTUNES, DP, SCHENKEL, M. dos S., RODRIGUES, AZ, & BRONDANI, IL (2020). **Effect of supplementation of beef cattle on tropical pasture: meta-analytic approach**. Semina: Agricultural Sciences, 41(5sup1), 2381–2390.
- [6] COSTA, NL; MONTEIRO, ALG; SILVA, ALP et al. **Considerations on fiber degradation in tropical forages associated with energy or nitrogen supplements**. Arch. Zootec., v.64, p.31-41, 2015.
- [7] CUNNINGHAM, JG, KLEIN, BG Textbook of Veterinary Physiology. 4th ed. Rio de Janeiro: Guanabara Koogan, 2008. 710 p.
- [8] EUCLIDES, VP Batista. Alternatives for intensifying beef production on pasture. Campo Grande: Embrapa Gado de Corte, 2000. 65p. Feed supplementation with concentrate on pastures. Agricultural Vision nº3 Jan/Jun 2005.
- [9] EUCLIDES FILHO, K. **Beef cattle farming in the Brazilian cerrado**. Brasília: EMBRAPA Cerrados, 2008.
- [10] EMBRAPA. Brazilian Agricultural Research Company. **Cattle feeding in the dry season: Principles and procedures**. 1979. Available in: <https://old.cnpqg.embrapa.br/> /Accessed on: 09/12/2023.
- [11] GARCIA, J.; EUCLIDES, VP; ALCALDE, CR et al. Consumption, grazing time and performance of steers supplemented on Brachiaria decumbens pastures, during the dry period. Science Agra. v. 35, no. 4, p.2095-2106, 2014
- [12] GOMES, RC; NUÑEZ, AJC; MARINO, CT; MEDEIROS, SR **Feeding strategies for beef cattle: supplementation to pasture, semi-confinement and confinement**, 2015. Available at: <https://www.alice.cnptia.embrapa.br/> /Accession: 04/10/2023.
- [13] HOOVER, WH (1986) Chemical factors involved in ruminal fiber digestion. **Journal of Dairy Science**. p.2749.
- [14] KÖNIG, HE; LIEBICH, HG Anatomy of Domestic Animals: Text and Color Atlas. 6th ed., Artmed Editora, 2016. 824p.
- [15] LANGE, A.. Pasture supplementation for meat production. CREA. Applied research collection. 2nd ed., 1980.
- [16] LAZZARINI NETO, S. Creates and recreates. Viçosa: Learn Easy, 2000.
- [17] MARION, JC Rural Accounting: Agricultural Accounting, Livestock accounting, Income Tax – Legal Entities. São Paulo, 2007, 278p
- [18] MATEUS, RG; DA SILVA, FF; ÍTAVO, LCV; PIRES, AJV; SIVAR.R.; SCHIO, AR Supplements for breeding Nelore cattle in the dry season: performance, consumption and nutrient digestibility. Acta Scientiarum Animal Sciences, 33(1), 87-94, 2011. Available at: <https://doi.org/10.4025/actascianimsci.v33i1.9100> /Accessed on: 08/23/2023.
- [19] MALAFAIA, P.; PEIXOTO, PV; GONÇALVES, JCS; MOREIRA, AL; COSTA, DPB; CORREA, W.S. **Weight gain and costs in beef cattle submitted to two types of mineral supplements**. Brazilian Veterinary Research. 24(3), 160-164, 2004.
- [20] MEDEIROS, SR; ALMEIDA, R.; LANNA, DPD **Rearing management - Efficiency of growth from weaning to finishing**. In: Pires, AV. Beef cattle farming. Piracicaba, FEALQ, v.1, p.760, 2010.
- [21] MORCELLI, Renan. Types of pasture for beef cattle: What is the best forage. PRODAP, 2020. Available at: <https://blog.prodap.com.br/pastagem-para-gado-de-corte-tipos-de-capim> /Accessed on: 08/24/2023.
- [22] MOREIRA, PSA; LOURENÇO, FJ; POLIZEL NETO, A.; HEINRICH, L. C.; BERBER, RCA Chromium chelate in mineral supplements for beef cattle. Comunicata Scientiae., 2012.39(3), 186-191.
- [23] OLIVEIRA, GO **Basic physiology**. 1st ed., INTA, p.184, 2016
- [24] PATTERSON, ALREADY BELYEA, RL BOWMAN, J.B. KERLEY, M.S. WILLIAMS, JE The impact of forage quality and supplementation on ruminant animal intake and performance. In: FAHEY JR, GC et al. (ed.), Forage quality evaluation, and utilization. ASA, CSSA, SSSA. Wisconsin. p.59-114, 1994.
- [25] FIGURINA, G. Nutritional aspects of calf supplementation under grazing conditions. In: Campo Natural - winter management and supplementation strategy. INIA, 1993.
- [26] PEIXOTO, PV; MALAFAIA, P.; BARBOSA, J. D; TOKARNIA Tokarnia, C. H. (2005). Principles of mineral supplementation in ruminants. Brazilian Veterinary Research. 25(3), 195-200.

- [26] PEREIRA, JRV; REIS, RA; BERCHIELLI, TT; BERTIPAGLIAS, LMA; MELO, GMP; **Supplementation of cattle kept on deferred Brachiaria brizantha (cv. Marandu) pasture: rumen parameters and degradability.** Acta Sci. Anim. Sci. Maringá, v. 30, no. 3, p. 317-325, 2008.
- [27] BRAZIL PORTAL: **Brazilian cattle herd grows and reaches 212.3 million heads of cattle Production.** São Paulo, 09 Oct. 2015
- [28] QUADROS, DG; SOUZA, HN; ANDRADE, AP et al. **Bioeconomic evaluation of supplementation strategies for zebu steers kept on deferred marandu grass pastures in the dry period.** R. Bras. Health and Prod. Anim., v.17, n.3, p.461-473, 2016
- [29] REIS, RA; MELO, GMP; BERTIPAGLIA, LMA **Optimization of the use of available forage through strategic supplementation.** In: FOOD IN RUMINANT PRODUCTION, 2., 2005, Jaboticabal. Annals... Jaboticabal: FUNEP, p.25-60, 2005.
- [30] REIS, RA; RUGGIERI, AC; OLIVEIRA, AA; AZENHA, MV; CASAGRANDE, DR; **Supplementation as a Quality Meat Production Strategy on Tropical Pastures.** Revista Brasileira Saúde Produção Animal, Salvador, v.13, n.3, p.642-655 Jul./September, 2012
- [31] REIS, RA; BARBERO, RP; KOSCHECK, FJFW; **Management of tropical pastures and feed supplementation for cattle.** VI Latin American Congress of Animal Nutrition. Estancia de São Pedro, São Paulo. 2014.
- [32] REBHUN, William. W. **Dairy cattle diseases.** 1st ed. São Paulo: Roca, 2000. 642p.
- [33] RESENDE, FD; SIQUEIRA, GR; OLIVEIRA, IM **Understanding the ox concept** 777. 1st ed. Jaboticabal-SP: Gráfica Miltipress Ltda, 2018. P. 123-125.
- [34] RODRIGUES, SS; FONSECA, CC; DAS NEVES, MT **Endocrine cells of the gastroenteropancreatic system: Concepts, distribution, secretions, action and control.** UNIPAR Veterinary Sciences and Zoology Archives, v.8, n.2, p.171-180, 2008.
- [35] RODRIGUES, IA **Semiological aspects of intestinal obstruction in cattle and reports of obstruction by phytobezoar.** 2018. 35p. Completion of course work. Bachelor of Veterinary Medicine awarded by the Federal University of Paraíba, 2018.
- [36] ROCK. MG **Supplementation to the beef cattle field.** 2020. Department of Animal Science UFSM. Available in: <https://www.ufsm.br/> Accessed on: 05/1-/2023.
- [37] SALMAN, A.K.D. **Practical manual for formulating feed for dairy cows/** Ana Karina Dias Salman, Elisa Köhler Osmari, Márcio Gregório Rojas dos Santos. -- Porto Velho, RO: Embrapa Rondônia, 2011
- [38] SENAR. National Rural Learning Service. **Cattle farming: management and feeding of beef cattle in confinement / National Rural Learning Service.** – Brasília: Senar, 2018. 56 p; ill. 21 cm (Senar Collection, 232).
- [39] SEVERINO, H. **Supplementation for cattle on pasture.** 2018. Available at: [https://files.cercomp.ufg.br/weby/up/186/o/Harianny\\_Severino.pdf](https://files.cercomp.ufg.br/weby/up/186/o/Harianny_Severino.pdf) Accessed on: 10/04/2023.
- [40] SILVA, JFC; LEÃO, MI **Fundamentals of ruminant nutrition.** Piracicaba: 1st ed., Livrocere, 1979. 384p.
- [41] SILVA, EIC **Methods for Formulating and Balancing Feeds for Cattle.** Belo Jardim, 2021. 95f. ill.: Federal Institute of Pernambuco – Belo Jardim. Pernambuco Agronomic Institute.
- [42] TEIXEIRA, S.; WHITE, AF; GRANZOTTO, F.; BARRETO, JC; ROME, CF C; COSTANEDA, RD **Sources of phosphorus in mineral supplements for beef cattle on Cynodon nlemfuensis Vanderyst pasture.** Brazilian Journal of Zootechnics. 40(1), p.190-199, 2011.
- [43] VALENTE, Ériton Egidio Lisboa. **Supplementation of grazing beef cattle with different protein:carbohydrate ratios from the breastfeeding phase to slaughter.** 2012. 131f. Thesis (Doctorate) – Federal University of Viçosa

## ANNEXURE 1

**Questionnaire applied to rural property owners. The data will be used to prepare a Scientific Article required to obtain a Bachelor's degree in Veterinary Medicine, at the UNEC Campus in Nanuque/MG.**

**County:** \_\_\_\_\_

**State:** \_\_\_\_\_

**Production:** ☐ Dairy cattle ☐ Beef cattle ☐ Both ☐ Others: \_\_\_\_\_

Type of Supplement	Whole herd	Only Matrices	Only Recreating Males	Only female breeding	Only male termination	Only Termination of Females
<b>Mineral</b>	<input type="checkbox"/> Whole year	<input type="checkbox"/> Whole year	<input type="checkbox"/> Whole year	<input type="checkbox"/> Whole year	<input type="checkbox"/> Whole year	<input type="checkbox"/> Whole year
	<input type="checkbox"/> Dry	<input type="checkbox"/> Dry	<input type="checkbox"/> Dry	<input type="checkbox"/> Dry	<input type="checkbox"/> Dry	<input type="checkbox"/> Dry
	<input type="checkbox"/> Water	<input type="checkbox"/> Water	<input type="checkbox"/> Water	<input type="checkbox"/> Water	<input type="checkbox"/> Water	<input type="checkbox"/> Water
	<input type="checkbox"/> Do not use	<input type="checkbox"/> Do not use	<input type="checkbox"/> Do not use	<input type="checkbox"/> Do not use	<input type="checkbox"/> Do not use	<input type="checkbox"/> Do not use



<b>Protei- nado</b>	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use
<b>Feed 18% CP</b>	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use
<b>20% CP feed</b>	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use
<b>Other:</b> ____ _____ _____	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use	<input type="checkbox"/> Whole year <input type="checkbox"/> Dry <input type="checkbox"/> Water <input type="checkbox"/> Do not use